

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

REMARKSRejections Under 35 U.S.C. §112, Second Paragraph.

Claims 1 and 10 have been amended to address this ground for rejection.

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Rejection of Claims 10 and 12 Under 35 U.S.C. §102(b) based on *Mintz* (U.S. Patent No. 5,391,275).

10 The invention of claim 10 is directed to a method of cleaning a reactive plasma chamber part. The method includes plasma cleaning a chamber part of a material redistributed on the chamber part by a reactive plasma process, with a plasma having an etch selectivity between the chamber part and the redistributed material that is greater than 100:1.

As is well established, anticipation requires the presence of a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim.<sup>1</sup>

15 The cited reference *Mintz* is directed to method of preparing a shield or clamping ring that is used in a physical vapor deposition chamber. In a physical vapor deposition process, material from a target is dislodged by reactive ions and sputtered onto a workpiece.<sup>2</sup> Sputtered material is intentionally accumulated on a chamber shield and clamping ring. Thus, a chamber shield/clamping ring is periodically cleaned of sputtered material and conditioned (e.g., surface roughened) to improve sputtered material adhesion. In this way, excess sputtered material can be  
20 prevented from flaking off chamber parts onto a workpiece.<sup>3</sup> All sputtered materials (i.e., target materials) described in *Mintz* are metal containing materials.<sup>4</sup> A chamber shield and ring are made of similar, if not identical, materials.<sup>5</sup>

Thus, in the process of *Mintz*, a chamber shield or ring having a surface of one material (e.g., titanium, aluminum, tungsten or molybdenum) can be covered by a redistributed target

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<sup>1</sup> See *Lindemann Maschinenfabrick GmbH v. American Hoist & Derrick Co.*, 221 USPQ 481, 485 (Fed. Cir. 1984).

<sup>2</sup> See *Mintz*, Col. 1, Lines 19-23.

<sup>3</sup> See *Mintz*, Col. 1, Lines 34-36.

<sup>4</sup> See *Mintz*, Col. 1, Line 20, Col. 2, Lines 62-63, Col. 3, Line 49, which describe titanium tungsten (TiW) as a target material. See also, Col. 3, Lines 7-8, which describes titanium-tungsten or other alloy as target materials. See also, Col. 5, Lines 28-33, which describes TiW, "pure" tungsten, and titanium nitride as target materials.

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material that is similar, if not identical, to a chamber ring/shield material (e.g., titanium-tungsten, tungsten, titanium nitride, or some other alloy).

While *Mintz* does describe a sputter etch cleaning step (argued to correspond to Applicants' plasma cleaning), such a step does not clean the chamber ring or shield of a redistributed material (e.g., target material). Instead, such a step is intended to remove diffusion barrier materials, such as oxide, which may be grown on a target surface.<sup>6</sup> In addition, the sputter etch cleaning step is intended to etch the target ring or shield itself.<sup>7</sup> Thus, *Mintz* does not teach plasma cleaning a chamber part of a redistributed material.

Further, Applicants assert that not only does *Mintz* not show or suggest Applicants' plasma cleaning limitation, but the reference teaches away from Applicants' very clear limitation of an etch selectivity between the chamber part and the redistributed material that is greater than 100:1.

The rejection takes official notice that the etch selectivity of claim 1 is inherent in the reference *Mintz*. Applicants seasonably traverse this statement and request evidence in support. Applicants strongly believe that if one etched with argon gas, as described in *Mintz*, the selectivity between the chamber shield/ring materials (titanium, aluminum, tungsten or molybdenum) and the target materials (titanium-tungsten, tungsten, titanium nitride, or some other alloy) would be far less than 1:100, and in some cases 1:1, as the materials would be identical. It is believed that an etch selectivity of about 1:1 clearly teaches away from Applicants claimed range of about 1:100.

Accordingly, because the cited reference does not show or suggest all limitations of claim 10, the rejection of claims 10 and 12 is traversed.

Rejection of Claims 1, 4-8, 10, 12 and 14-18 Under 35 U.S.C. §103(a), based on *Mintz* in view of *Weber et al.* (U.S. Patent No. 5,958,143).

The rejection of claims 1 and 4-8 will first be addressed.

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<sup>5</sup> See *Mintz*, Col. 5, Lines 17-21, which describes shields of titanium or stainless steel covered with aluminum, tungsten, or molybdenum as a chamber ring/shield material.

<sup>6</sup> See *Mintz*, Col. 4, Lines 36-37.

<sup>7</sup> See *Mintz*, Col. 4, Lines 40-44, which describes forming a micro surface roughness on a chamber shield or ring.

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The invention of amended claim 1 is directed to a method that cleans a plasma reactor chamber part of a material redistributed thereon by a reactive plasma process by placing the chamber part in a redistributed material solvent.

As is well understood, to establish a prima facie case of obviousness, a rejection must meet three basic criteria. First, there must be some suggestion or motivation to modify a reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference(s) must teach or suggest all claim limitations.

It is believed that a prima facie case of obviousness has not been established for claim 1 as the cited combination of references does not teach all limitations of claim 1.

Claim 1 recites placing a chamber part in a redistributed material solvent. Such a limitation is not shown or suggested by the references.

It is admitted that *Mintz* does not show placing a chamber part in a redistributed material solvent.<sup>8</sup> The rejection would modify *Mintz* according to *Weber et al.*, which teaches the cleaning of optical substrates with various materials: soap, freon, trichloroethylene, acetone, methanol, or pH neutral soap.<sup>9</sup> However, none of these materials is a solvent of the redistributed material of *Mintz* (e.g., titanium-tungsten, tungsten, titanium nitride, or some other alloy). Thus, the cited combination does not show all limitations of claim 1.

Applicants note that attempting incorporating solvent techniques for removing a deposited metal or metal-containing material teaches away from organic solvents.<sup>10</sup>

In addition, it is believed that there is no motivation for the cited combination. *Weber et al.* is directed to cleaning an optical substrates before coating such substrates with a reflective coating. The invention is thus directed to assuring that no roughness or particles remain on the surface.<sup>11</sup> *Mintz* teaches away from this. *Mintz* purposely roughens chamber rings and shields.<sup>12</sup>

Still further, *Mintz* is directed to cleaning and conditioning a chamber ring and shield for a physical vapor deposition chamber. *Weber et al.* is unrelated to plasma chambers entirely, being directed at cleaning an optical substrate prior to processing (having a reflective coating put

<sup>8</sup> See the Office Action, dated 7/2/2002, Page 4, Lines 10-11.

<sup>9</sup> See *Weber et al.*, Col. 1, Lines 28-30 and Col. 2, Lines 28-30.

<sup>10</sup> If a redistributed material is a metal or contains metal, a very strong acid is likely solvent. Note, however, such a strong acid would likely etch a metal chamber part.

<sup>11</sup> See *Weber et al.*, Col.

<sup>12</sup> See *Mintz*, Col. 2, Lines 31-32 and 45, Col. 3, Lines 47-48, Col. 4, Lines 40-41.

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thereon). Thus, it is not believed that one skilled in the art would look to cleaning approaches for optical projection imaging devices (made from optical substrates) in order to clean and condition parts covered with a plasma deposited metal, or metal containing material.

Accordingly, because the cited combination of references does not show all limitations of claim 1, and because motivation for the proposed combination is believed to be lacking, the rejection of claim 1 is traversed.

Claim 4, which depends from claim 1, adds the limitation of placing the chamber part in the solvent for at least 6 hours. It is admitted that the limitations of claim 4 are not shown in the references.<sup>13</sup>

Applicants acknowledge that in some cases optimization of ranges may not be obvious. However, such a determination is made only after the general conditions of a claim are disclosed in the prior art.<sup>14</sup> It not believed that placing an optical substrate in acetone for five minutes shows the same general conditions as placing a chamber part in a redistributed material solvent for at least 360 minutes, as applicants' claimed range over seventy times longer than that of the reference.

Accordingly, because it is admitted that the reference does not show the limitations of claim 4, and cited reference does not show the same general conditions as claim 4, Applicants range it not obvious, and this ground for rejection is traversed.

For all of these reasons, the rejection of claims 1 and 4-8 is traversed.

The rejection of claims 10, 12 and 14 will now be addressed.

To the extent that this ground for rejection relies on *Mintz*, the comments for the 102(b) rejection of claim 10 are incorporated by reference herein. Namely, that Applicants traverse the assertion that the reference inherently shows an etch selectivity of 1:100, as it most likely shows one of about 1:1. *Weber et al.* provides no teachings regarding etch selectivity.

Accordingly, all limitations of claim 10 are not shown in the cited combination of references, thus a prima facie case of obviousness for claim 10 has not been established.

To the extent that this ground for rejection relies on the combination of *Mintz* in view of *Weber et al.*, Applicants incorporate by reference herein the comments set forth above for claim

<sup>13</sup> See the Office Action, dated 7/2/2002, Page 4, Lines 17-18.

<sup>14</sup> MPEP § 2144.05, II. A.

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1. Namely, that motivation for the combination is lacking.

For all of these reasons, the rejection of claim 10 is traversed.

Claim 14, which depends from claim 10, adds the limitation of cleaning the chamber part with a solvent of the redistributed material. To address this ground for rejection, Applicants  
5 incorporate by reference herein the comments set forth above for claim 1. Namely, that the cited combination does not show or suggest this limitation – as the combination would place a chamber part with a redistributed metal containing material into acetone. Acetone is not a metal solvent.

For all of these reasons, the rejection of claims 10, 12 and 14 is traversed.

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The rejection of claims 15-18 will now be addressed.

The invention of claim 15 is directed to a method of cleaning reactive plasma chamber parts that includes applying an organic solvent to a surface of a chamber part. The method also includes oxygen plasma cleaning the chamber part.

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To the extent that this reference relies on the combination of *Mintz* in view of *Weber et al.*, Applicants incorporate by reference herein the comments set forth above for claim 1. Namely, that motivation for the combination is lacking. Accordingly, the rejection of claims 15-18 is traversed.

20 Rejection of Claims 1, 4-8, 10, 12 and 14-18 Under 35 U.S.C. §103(a), based on *Mintz* in view of *Wu et al.* (U.S. Patent No. 5,855,974).

The rejection of claims 1 and 4-8 will first be addressed.

With regard to claim 1, it is admitted that *Mintz* does not show placing a chamber part in a redistributed material solvent.<sup>15</sup> The rejection would modify *Mintz* according to *Wu et al.*,  
25 which teaches the cleaning of a scribing wheel with an organic solvent to remove a liquid cleaner and other impurities.<sup>16</sup> However, as in the case *Weber et al.*, none of these materials is a solvent of the redistributed material of *Mintz* (e.g., titanium-tungsten, tungsten, titanium nitride, or some other alloy). Thus, the cited combination does not show all limitations of claim 1.

In addition, it is believed that there is no motivation for the cited combination. *Mintz* is

<sup>15</sup> See the Office Action, dated 7/2/02, Page 6, and Lines 12-13.

<sup>16</sup> See the *Wu et al.*, Col. 3, Lines 32-35.

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directed to cleaning a chamber ring and shield for a physical vapor deposition chamber. The organic solvent cleaning steps of *Wu et al.* are unrelated to plasma chambers entirely, being directed at cleaning scribing wheel before any plasma processing.

Accordingly, because the cited combination of references does not show all limitations of claim 1, and because motivation for the proposed combination is believed to be lacking, the rejection of claim 1 is traversed.

With regard to claim 4, Applicants incorporate by reference the same general comments as set forth above to address the rejection based on *Mintz* in view of *Weber et al.* Namely, that the rejection admits that the reference does not show the limitations of claim 4, and cited reference does not show the same general conditions as claim 4<sup>17</sup>. Accordingly, the cited range cannot be obvious.

The rejection of claims 10, 12 and 14 will now be addressed.

To the extent that this ground for rejection relies on *Mintz*, the comments for the 102(b) rejection of claim 10 are incorporated by reference herein. Namely, that Applicants traverse the assertion that the reference inherently shows an etch selectivity of 1:100, as it most likely shows one of 1:1. Like *Weber et al.*, *Wu et al.* provides no teachings regarding plasma cleaning.

Accordingly, all limitations of claim 10 are not shown in the cited combination of references, thus a prima facie case of obviousness for claim 10 has not been established.

To the extent that this ground for rejection relies on the combination of *Mintz* in view of *Wu et al.*, Applicants incorporate by reference herein the comments set forth above for claim 1. Namely, that motivation for the combination is lacking.

For all of these reasons, the rejection of claim 10 is traversed.

Claim 14, which depends from claim 10, adds the limitation of cleaning the chamber part with a solvent of the redistributed material. To address this ground for rejection, Applicants incorporate the same general comments set forth above for claim 1. Namely, that the cited combination does not show or suggest this limitation, as the cleaning materials of *Wu et al.* are not solvents of the redistributed material of *Mintz*.

For all of these reasons, the rejection of claims 10, 12 and 14 is traversed.

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<sup>17</sup> See *Wu et al.*, Col. 3, Lines 37, which teaches exposing a scribing wheel to an organic solvent for 10-30 minutes. Applicants' range remains 12-36 times greater.

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The rejection of claims 15-18 will now be addressed.

The invention of claim 15 is directed to a method of cleaning reactive plasma chamber parts that includes applying an organic solvent to a surface of a chamber part. The method also  
5 includes oxygen plasma cleaning the chamber part.

To the extent that this reference relies on the combination of *Mintz* in view of *Weber et al.*, Applicants incorporate by reference herein the comments set forth above for claim 1. Namely, that motivation for the combination is lacking. Accordingly, the rejection of claims 15-18 is traversed.

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Rejection of Claims 2, 3, 9, 11, 13 and 20 Under 35 U.S.C. §103(a), based on *Mintz* in view of *Weber et al.*, further in view of Applicants Background Art (*Background Art*).

The rejection of claims 2, 3 and 9 will first be addressed.

To the extent that this ground for rejection relies on the combination of *Mintz* in view of  
15 *Weber et al.*, the comments set forth above regarding this combination with respect to claim 1 are incorporated by reference herein. Namely, that *Mintz* in view of *Weber et al.* does not show all limitations of claim 1 (from which claims 2, 3 and 9 depend), and motivation for the proposed combination is believed to be lacking.

Claim 2 adds the limitation that the material redistributed on a reactor chamber part  
20 includes photoresist polymers.

A prima facie case of obviousness has not been established for claim 2, as the requisite motivation for adding the *Background Art* to the combination of *Mintz* in view of *Weber et al.* is believed to be lacking.

The *Background Art* teaches away from combination with *Mintz*. The *Background Art* is  
25 directed to methods of cleaning parts for a plasma etch chamber. That is, a chamber that removes material by plasma etching. In sharp contrast, *Mintz* is directed to physical vapor deposition. That is, a chamber that deposits a material from a target.

In addition, as is well understood if a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or

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motivation to make the proposed modification.<sup>18</sup> Still further, if a proposed modification or combination would change the principle operation of the prior art invention being modified, the teachings of the references are not sufficient to render the claims *prima facie* obvious.<sup>19</sup>

5 The rejection seeks to incorporate an etch mask structure (e.g., photoresist) into a physical deposition chamber. Such a combination is entirely unsatisfactory to the intended purpose of depositing a metal layer on a workpiece, as such metal would cover a photoresist layer. Alternatively, such a modification would change the principle operation of *Mintz* from adding a material (depositing) to removing a material (etching).

10 Accordingly, because motivation is lacking for the proposed combination relied upon, the rejection of claim 2 is traversed.

Claim 3 adds that a chamber part comprises quartz.

To address the rejection of claim 3, the comments set forth above for claim 2 are incorporated by reference herein. Namely, that motivation is lacking for the proposed combination.

15 Claim 9 adds baking the chamber part at a temperature in the general range of 75-150 °C.

To address the rejection of claim 9, the comments set forth above for claim 2 are incorporated by reference herein. Namely, that motivation is lacking for the proposed combination.

20 The rejection of claims 11, 12 and 20 will now be addressed.

To address this ground of rejection the comments set forth above for claim 2 are incorporated by reference herein. Namely, that motivation for the proposed combination is lacking.

25 Rejection of Claims 2, 3, 9, 11, 13 and 20 Under 35 U.S.C. §103(a), based on *Mintz* in view of *Wu et al.*, further in view of Applicants Background Art (*Background Art*).

The rejection of claims 2, 3 and 9 will first be addressed.

To the extent that this ground for rejection relies on the combination of *Mintz* in view of *Wu et al.*, the comments set forth above regarding this combination with respect to claim 1 are

<sup>18</sup> *In re Gordon*, 221 USPQ 1125 (Fed. Cir. 1984).

<sup>19</sup> *In re Ratti*, 123 USPQ 349 (CCPA 1959).



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incorporated by reference herein. Namely, that *Mintz* in view of *Wu et al.* does not show all limitations of claim 1 (from which claims 2, 3 and 9 depend) and because motivation for the proposed combination is believed to be lacking.

5 In addition, a prima facie case of obviousness has not been established, as the requisite motivation for adding the *Background Art* to the combination of *Mintz* in view of *Wu et al.* is also lacking.

As noted above, the *Background Art* teaches away from combination with *Mintz*, and the proposed combination is both unsatisfactory for its intended purpose and would change the principle operation of the prior art invention being modified.

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To address the rejection of the remaining claims 11, 13 and 20, the comments set forth above for claim 2 are incorporated by reference herein. Namely, that motivation is lacking for the proposed combination.

15 Rejection of Claim 19 Under 35 U.S.C. §103(a), based on *Mintz* in view of *Weber et al.*, further in view of *Walter* (U.S. Patent No. 6,348,101).

Claim 19, which depends from claim 18, adds the rinsing of a chamber part with a liquid that evaporates at a higher temperature than water after ultrasonically cleaning the part.

20 To the extent that this ground this ground for rejection relies on the combination of *Mintz* in view of *Weber et al.*, the comments set forth above for claim 1 with respect to the this combination are incorporated by reference herein. Namely, that motivation for the proposed combination is lacking.

25 Rejection of Claim 19 Under 35 U.S.C. §103(a), based on *Mintz* in view of *Wu et al.*, further in view of *Walter*.

To the extent that this ground for rejection relies on the combination of *Mintz* in view of *Wu et al.*, the comments set forth above regarding this combination with respect to claim 1 are incorporated by reference herein. Namely, that motivation for the proposed combination is lacking.

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Claims 1 and 10 have been amended, not in response to the cited art, but to more clearly point out the subject matter of the claims. The present claims 1-20 are believed to be in allowable form. It is respectfully requested that the application be forwarded for allowance and issue.

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Respectfully Submitted,

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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**Version With Markings to Show Changes MadeIn the Claims.

## 5 1. (Amended) A method, comprising:

cleaning a plasma reactor chamber part [, that may have] of a material redistributed thereon by a reactive plasma process, by placing the chamber part in a redistributed material solvent.

## 10 10. (Amended) A method of cleaning a plasma reactor chamber part, comprising:

plasma cleaning a chamber part [, that may have having] of a material redistributed on the chamber part by a reactive plasma process, with a plasma having an etch selectivity between the chamber part and the redistributed material that is greater than 1:100.

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